

**Appl. No. 10/037,806  
Amdt. dated July 12, 2004  
Reply to Office action of May 20, 2004**

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Currently amended) A method comprising:  
performing, by a software stream, heap memory operations on a first end of a linked list of free heap memory of a heap pile; and concurrently returning, ~~by a hardware device~~, a return block of heap memory, ~~by a hardware device that used the return block of heap memory~~, to the heap pile at a second end of the linked list of free heap memory.
2. (Cancelled).
3. (Currently amended) The method as defined in claim 1 wherein returning ~~the a return block of heap memory at the second end of the linked list~~ further comprises:  
writing a null to a next block field of the return block of heap memory;  
writing a block number of the return block of heap memory to a next block field of a last block of heap memory in the linked list;  
changing the contents of a bottom register to point to the return block of heap memory; and thereby  
making the return block of heap memory a last entry in the linked list.
4. (Previously presented) The method as defined in claim 1 wherein performing heap memory operations further comprises returning, by the software stream, a second block of heap memory by placing the second block of heap memory at the first end of the linked list.

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5. (Previously presented) The method as defined in claim 4 wherein returning the second block of heap memory at the first end of the linked list by the software stream further comprises:

determining a block number of a primary block of heap memory resident at the first end of the linked list;  
writing the block number of the primary block of heap memory to a next block field of the second block; and  
writing atomically a block number of the second block to a top register.

6. (Previously presented) The method as defined in claim 5 wherein determining a block number of a primary block of heap memory resident at the first end of the linked list further comprises reading the top register prior to writing the block number of the second block.

7. (Previously presented) The method as defined in claim 1 wherein performing heap memory operations further comprises removing, by the software stream, heap memory from the first end of the linked list.

8. (Previously presented) The method as defined in claim 7 wherein removing heap memory from the linked list heap management system further comprises taking a primary block of heap memory resident at the first end of the of the linked list.

9. (Previously presented) The method as defined in claim 8 wherein taking a primary block of heap memory further comprises:

determining a block number of the primary block;  
reading a next block field of the primary block of memory; and  
removing the primary block if the next block field of the primary block does not indicate a null.

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10. (Original) The method as defined in claim 9 wherein determining a block number of the primary block further comprises reading a top register, wherein the top register identifies the beginning of the linked list.
11. (Original) The method as defined in claim 9 wherein removing the primary block if the next block field of the primary block does not indicate a null further comprises writing a block number of the next block field of the primary block to the top register.
12. (Currently amended) A method of managing a heap memory comprising:  
maintaining unused blocks of heap memory as a linked list, and wherein  
the unused blocks of the linked list comprise a first block at a  
beginning of the linked list, a second block pointed to the first block,  
and a third block at an end of the linked list;  
removing, by a software stream, the first block from the linked list, thus  
making the second block the beginning of the linked list; and  
returning, by a hardware device, a return block, by a hardware device that  
used the return block, to the linked list by placing the return block at  
the end of the linked list.
13. (Currently amended) The method of managing a heap memory as defined  
in claim 12 wherein returning, by a hardware device, a return block to the linked  
list by placing the return block at an end of the linked list further comprises:  
writing a null to a next block field of the return block;  
reading a bottom register, the bottom register identifying the third block;  
writing a block number of the return block to a next state field of the third  
block; and  
writing the block number of the return block to the bottom register.

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14. (Original) The method of managing a heap memory as defined in claim 12 wherein removing, by a software stream, the first block from the linked list further comprises:

reading a top register, the top register identifying the first block;  
reading a next block field of the first block, the next block field of the first block identifying the second block; and  
writing a block number of the second block to the top register.

15. (Original) The method of managing a heap memory as defined in claim 14 wherein writing a block number of the second block to the top register further comprises atomically writing the block number of the second block to the top register.

16. (Original) The method of managing a heap memory as defined in claim 12 further comprising returning, by a software stream, a fourth block to the linked list by placing the fourth block at the beginning of the linked list, thus making the fourth block the beginning of the linked list.

17. (Original) The method of managing a heap of memory as defined in claim 16 wherein returning a fourth block to the linked list by placing the fourth block at the beginning of the linked list further comprises:

reading a top register, the top register identifying the beginning of the linked list;  
writing a block number of the block identified by the top register to a next state field of the fourth block; and  
writing a block number of the fourth block to the top register.

18. (Original) The method of managing a heap memory as defined in claim 17 wherein writing a block number of the fourth block to the top register further comprises atomically writing the block number of the fourth block to the top register.

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19. (Currently amended) A method of managing a heap memory in a computer system, the method comprising:

allowing a software thread to add and remove blocks of heap memory from a linked list of free blocks of heap memory in a last-in/first-out (LIFO) fashion at a first end of the linked list; and

allowing a hardware device that uses blocks of heap memory to add the blocks of heap memory to the linked list of free blocks of heap memory at a second end of the linked list.

20. (Original) The method of managing a heap memory in a computer system as defined in claim 19 wherein allowing a software thread to remove blocks of heap memory in LIFO fashion further comprises:

determining, by the software thread, a block number of a block of heap memory at the first end of the linked list; and

removing the block of heap memory at the first end of the linked list.

21. (Original) The method of managing a heap memory in a computer system as defined in claim 20 determining a block number of a block of heap memory at the first end of the linked list further comprises reading a beginning register that stores a block number of a block of heap memory at the first end of the linked list.

22. (Original) The method of managing a heap memory in a computer system as defined in claim 21 wherein removing the block of heap memory at the first end of the linked list further comprises:

reading a next block field of the block of heap memory at the first end of the linked list to identify a block number of a next block in the linked list; and

writing the block number of the next block in the linked list to the beginning register.

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23. (Original) The method of managing a heap memory in a computer system as defined in claim 20 wherein allowing a software thread to add blocks of heap memory in LIFO fashion further comprises:

determining, by the software thread, a block number of a block of heap memory at the first end of the linked list;  
writing the block number of the block of heap memory at the first end of the linked list to a next block field of a return block of heap memory;  
and  
making the return block of heap memory the first end of the linked list.

24. (Original) The method of managing a heap memory in a computer system as defined in claim 23 wherein determining a block number of a block of heap memory at first end of the linked list further comprises reading a beginning register that stores a block number of a block of heap memory at the first end of the linked list.

25. (Original) The method of managing a heap memory in a computer system as defined in claim 24 wherein making the return block of heap memory the first end of the linked list further comprises writing a block number the return block of heap memory to the beginning register.

26. (Currently amended) The method of managing a heap memory in a computer system as defined in claim 20 wherein allowing a hardware device that uses blocks of heap memory to add the blocks of heap memory to the linked list of free blocks of heap memory at a second end of the linked list further comprises:

determining, by the hardware device, a block number of a block of heap memory at the second end of the linked list;  
writing, by the hardware device, a block number of a return block of heap memory to a next block field of the block of heap memory at the second end of the linked list; and

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making the return block of heap memory the second end of the linked list.

27. (Original) The method of managing a heap memory in a computer system as defined in claim 26 wherein determining a block number of a block of heap memory at the second end of the linked list further comprises reading an end register that stores a block number of the block of heap memory at the second end of the linked list.
28. (Original) The method of managing a heap memory in a computer system as defined in claim 27 wherein making the return block of heap memory the second end of the linked list further comprises writing a block number the return block of heap memory to the end register.
29. (Currently amended) A computer system comprising:
  - a microprocessor executing a software stream;
  - a main memory array, a portion of the main memory array allocated to be a heap memory, and wherein unused portions of the heap memory are part of a heap pile, the heap pile further comprising
    - a plurality of blocks;
    - each block having a next block field; and
    - wherein the heap pile is maintained as a linked list, each block's next block field pointing to a next block in the list;
  - a first bridge logic device coupling the microprocessor to the main memory array;
  - a hardware device coupled to the heap memory through the first bridge logic device;

wherein the software stream executed on the microprocessor removes blocks of heap memory from a beginning of the heap pile; and simultaneously

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the hardware device returns blocks of heap memory used by the hardware device to an end of the heap pile.

30. (Previously presented) The computer system as defined in claim 29 wherein the plurality of blocks each have the same number of bytes.

31. (Cancelled).

32. (Currently amended) The computer system as defined in claim 29 further comprising the software stream returns blocks to the heap pile at the beginning of the heap pile simultaneously as the hardware device returns blocks of heap memory used by the hardware device to the end of the heap pile.

33. (Original) The computer system as defined in claim 29 wherein the hardware device is the graphics card.

34. (Original) The computer system as defined in claim 29 wherein the hardware device is a network interface card.

35. (Original) The computer system as defined in claim 29 wherein the hardware device is an audio card.

36. (Original) The computer system as defined in claim 29 wherein the hardware device is a mass storage device.

37. (Original) The computer system as defined in claim 36 wherein the mass storage device is a hard drive.

38. (Original) The computer system as defined in claim 37 wherein the mass storage device is compact disk storage device.